User's manual for TIMRET: a micro-computer program for silviculture investment analysis

W.J. Ondro and W. Marshall

Natural Resources Canada
Canadian Forest Service

Ressources naturelles Canada
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The Canadian Forest Service's Northwest Region is responsible for fulfilling the federal role in forestry research, regional development, and technology transfer in Alberta, Saskatchewan, Manitoba, and the Northwest Territories. The main objectives are research and regional development in support of improved forest management for the economic, social, and environmental benefit of all Canadians. The Northwest Region also has responsibility for the implementation of federal–provincial forestry agreements within its three provinces and territory.

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USER'S MANUAL FOR TIMRET: A MICRO-COMPUTER PROGRAM FOR SILVICULTURE INVESTMENT ANALYSIS

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ABSTRACT

This manual describes the usage of a micro-computer software package, TIMRET (TIMber RETurns), which was developed to aid the forest manager in evaluating profitability of silvicultural investments. Returns from a range of investment scenarios, e.g., forest renewal, cleaning, spacing, thinning, release, fertilization, and tree improvements, can be calculated and compared by using any of the following criteria: 1) internal rate of return, 2) present net worth, 3) profitability index, and 4) benefit/cost ratio. TIMRET calculates returns from treatment costs, and benefits such as increased yield, size premiums, logging cost reductions, and product from trees removed by treatment. The output of the financial analysis can be presented in a tabular or graphical form. Examples of these inputs and examples of TIMRET calculations are provided.

RÉSUMÉ

Ce manuel décrit l'utilisation du programme d'ordinateur TIMRET (TIMber RETurns), conçu pour aider le gestionnaire forestier à évaluer la productivité des investissements en sylviculture. Des rendements à partir de plusieurs scénarios, comme le renouvellement forestier, le dégagement, l'espacement, l'éclaircissement, les coupes de dégagement, la fertilisation ainsi que l'amélioration des arbres peuvent être ainsi calculés et comparés à l'aide de l'un ou l'autre des critères suivants: 1) le taux interne de rendement, 2) la valeur nette actuelle, 3) l'index de rentabilité, et4) le rapport bénéfice/coût. TIMRET calcule le rendement à partir des coûts de traitement et les bénéfices tels le rendement accru, l'accroissement de la dimension, la réduction des coûts d'abattage et les produits tirés des arbres sacrifiés par le traitement. Le produit de l'analyse finale peut être présenté sous forme de graphiques ou de tableaux. Vous y trouverez des exemples de calculs préparés par TIMRET.

CONTENTS

INTRODUCTION 1

STARTING TIMRET 1

TERMINOLOGY 1

FINANCIAL ANALYSES 2
- Management Scenario Analysis 2
- Marginal Analysis 2
- Starting and Ending Analysis Cases 3
- Year Markers 3

ENTERING DATA 3
- Title 3
- Benefits/Costs 3
- Timing of Treatments 3
- Economic Parameters 3

EDITING DATA 3
- Typeover 3
- Edit Mode 3

TREATMENT 4
- Description 4
- Present Value 4
- First Year 4
- Last Year 4
- Step Year 4

ECONOMIC PARAMETERS 4
- Discount Rates 4
- Inflation Rate 4
- Discounting 4
- Cash Flows 4

ACTIVITY LIST 5

FINANCIAL ANALYSIS RESULTS 5
- Tabular Presentation 5
- Internal Rate of Return 5
- Present Net Worth 5
- Benefit/Cost Ratio 5
- Profitability Index 5
- Graphic Output 5

SAVE/LOAD/DELETE 6
- Saving the Current Case 6
- Retrieving a Case 6

ADVICE WHEN USING TIMRET 6
- Distinguishing Cases from Worksheets 6
- Making Backups 6
- Verifying Inputs 6

TROUBLE-SHOOTING GUIDE 7
Too Many Cash Flows 7
Long Investment Periods 7

GENERAL INFORMATION 7

ACKNOWLEDGMENT 7

APPENDIXES

1. TIMRET Quick Reference 8

2. Suggested Readings 9

FIGURES

1. Output from TIMRET showing profitability analysis of lodgepole pine thinning by present net worth 5

2. Output from TIMRET showing profitability analysis of lodgepole pine thinning by benefit/cost ratio 5

3. Output from TIMRET showing profitability analysis of lodgepole pine thinning by profitability index 6

TABLES

1. Screen display of TIMRET financial information on treatment benefit/cost and stand age at activity or harvest 2

2. Screen display of TIMRET financial returns at rotation 2

NOTE

The exclusion of certain manufactured products does not necessarily imply disapproval nor does the mention of other products necessarily imply endorsement by Natural Resources Canada.

INTRODUCTION

In today's increasingly complex decision environment, the forest manager needs a simple, quick, user-friendly, and flexible financial analysis software to help make decisions about possible forest management scenarios. TIMRET, a recently developed forestry investment analysis software package, is a tool developed by the authors that is intended to meet this need. TIMRET, an acronym for TIMber RETurns, is a software package that can be run on any IBM-compatible personal computer that has a 3.1 or higher version of the DOS-based Lotus 1-2-3 spreadsheet package.

Inputs to the program specify discount rates and management scenarios such as forest fertilization, spacing, thinning, release, tree improvement, and wetland drainage. The program can calculate returns for any management practice that brings improved timber benefits such as increased stem wood yields, log size premiums, logging cost reductions from harvesting bigger trees, and products from trees removed by treatments. The analyst can file selected steps (computer runs), such as cost and benefits, into individual cases, that can be saved on disk, retrieved, and modified for further analysis. With TIMRET, the analyst can compute cash flow from investments before income taxes for six discount rates. Summaries of result can be displayed and viewed on the screen and printed. TIMRET can calculate financial returns by hectare, stand, or whole forest. Each case is defined by a series of steps that specify costs and revenues. Net revenues are generated from these steps, and are subsequently used to calculate financial returns.

This manual is organized in sections. The first section explains how to start up the TIMRET diskette. The following sections explain terminology used, the type of financial analyses TIMRET can be used for, and entering and editing of data. Subsequent sections describe the presentation (of results) of the financial analysis (i.e., tabular and graphical outputs). In the concluding sections of this manual, advice to TIMRET users and general information are given.

STARTING TIMRET

To start TIMRET, insert the TIMRET floppy diskette into your drive.[1] The program can be run on a 286, 386, or 486 SX or DX IBM-compatible personal computer with Lotus 1-2-3 version 3.1+ installed. Ensure that the directory containing Lotus 1-2-3 is included in the Path statement in the Autoexec.bat file (path=C:\123R3).

Type **a:tima [enter] [enter] [enter]**, if your drive is "a", or **b:tima [enter] [enter] [enter]**, if your drive is "b". Upon execution, a title screen will appear for a short time after which the preloaded example will appear (Tables 1 and 2).

TERMINOLOGY

Revenues (benefits)—appear as positive number on display and printouts.

Costs—appear as negative numbers on display and printouts.

Timber yield and depletion—expressed in dollars per hectare ($/ha). All timber volumes are converted to m^3/ha for computing volumes for a stand or forest. The volumes are multiplied by market value of stumpage [in m^3 or foot board measure (fbm)] and entered.

[1] TIMRET diskette can be obtained from the senior author.

Table 1. Screen display of TIMRET financial information on treatment benefit/cost and stand age at activity or harvest

Benefit/cost item	Treatment ($/ha)		Stand age at activity or harvest (year)		
	Benefit	Cost	First	Step[a]	Last
Treatment cost	n/a[b]	–400	25	1	25
Trees removed by treatment	220	n/a	25	1	25
Market value of increased yield	680	n/a	60	1	60
Log size premium	65	n/a	60	1	60
Conventional logging cost reduction[c]	880	n/a	60	1	60

[a] Denotes the number of years between first and last activity.

[b] n/a = not applicable.

[c] Denotes the difference in logging cost between untreated and treated stands.

Table 2. Screen display of TIMRET financial returns at rotation

Criterion	Discount rate					
	3%	4%	5%	6%	8%	10%
Present net worth ($/ha)	397.50	231.80	114.60	31.42	–70.09	–122.18
Benefit/cost ratio	1.99	1.58	1.29	1.08	0.82	0.69
Profitability index ratio	0.99	0.58	0.29	0.08	–0.18	–0.31

Note: specified inflation rate is 0%.
Internal rate of return (%) is 6.49 for 3–10% discount rate.

Cash flows—assumed to occur at the beginning of the year. Costs or revenues occurring in Year 1 are discounted for one year.

Data—Steps describing forest management practices can be specified and entered in any order.

Press **<RETURN>** key after every entry. Cursor control is done by the arrow keys.

FINANCIAL ANALYSES

The software can compute returns for management scenarios that include several treatments, or can evaluate profitability of a specific treatment, either for a portion of a rotation or the whole rotation.

Management Scenario Analysis. Most financial analyses are done to find out treatment profitability for a stand or an entire forest. In order to analyze various management scenarios, the analyst should specify all management activities or practices from the start to the end of the rotation. Results of the analyses will reflect the returns for the treatment(s) costs and their timing.

Marginal Analysis. These determine the effect of an additional treatment, such as better site preparation, thinning, or more fertilizer on wood yield. Financial returns are based on cash-flow differences between a stand that received the extra treatment and one that did not.

Starting and Ending Analysis Cases. A typical forest investment starts with the establishment of a new stand or forest, but TIMRET can begin or end at any specified time. Often, the starting point is a major expenditure or treatment. The analyst needs to identify the first and last investment activity. Beginning activities include site clearing, site preparation, natural regeneration, and planting; some intermediate treatments such as cleaning, spacing, thinning, or fertilizing can be beginning activities for other investments. Ending activities are usually final harvests and timber disposal.

Year Markers. TIMRET sets the base year for the investment at the first specified activity. All cash flows are discounted back to this. If an earlier base year is desired, add a null activity to set it, such as (C/B = O).

ENTERING DATA

An analysis requires four data groups that must be entered to identify and define a case. The data entry order is arbitrary. To add an entry, move to an empty row of the editing area and type in information for each of the following:

Title. It contains description of cost or benefit. To enter a title, move cursor to the left-most column (A) and type it.

Benefits/Costs. It describes and gives numerical values to treatment costs, yields, products, and prices. To enter a benefit/cost, type the negative cost value into the cost column (B) or the positive benefit value into the benefit column (C).

Timing of Treatments. After entering description and numerical values of the cost or benefit, the timing of the treatment must be specified. The first year of the treatment is entered in the first-year column (D), and the last year of the treatment is entered in the last-year column (F). The number of years between treatments is specified in the step year column (E).

Economic Parameters. These are the discount rates and inflation rate. Default values are provided upon initial execution of TIMRET macro. To modify the economic parameters, execute the **Calculate** macro (Alt-C) to get the Calculate menu. Choose **Inflation** to modify the inflation rate or **Discount** to modify one of the discount rates. The new values are entered at the top of the screen. To restore default discount rates, execute the **Calculate** macro, then choose **Discount**, then **Default**.

EDITING DATA

Data-error checking is performed when calculating financial criteria. If an error occurs or information simply requires change, editing will be needed. There are two ways to edit data.

One way of editing is to **typeover**. Move the cursor over the cell that needs to be changed and type in an new value. This is done while in the default typeover mode, known as a READY mode. (See mode indicator at top right corner of screen).

The other way to correct data is through the **EDIT mode**. This mode is useful when the analyst wishes to avoid retyping the contents of the entire cell. To edit data using this method, move the cursor over the cell that requires editing and press the F2 key. (See mode indicator change to EDIT). The current value of the cell will appear at the top of the screen for editing. Use arrow keys to remove characters, and backspace or delete keys to delete characters. All other character keystrokes will cause that particular character to be inserted at the position of the cursor. Press **Enter** when satisfied, and the mode will once again be in the READY mode. Press **Esc** any time during editing to abort the edit.

TREATMENT

Treatment can be any forestry activity or practice such as planting, thinning, site preparation, or forest renewal. These activities that are expressed in costs and benefits for the investment. The speed and reliability of the analysis depends on how activities are entered and specified. Erroneous specification of activities will produce wrong analyses.

TIMRET checks for and alerts the user to obvious entry errors, such as a positive cost or negative benefit, but cannot check for treatments cost. For example, $400/ha for thinning is as valid as $40/ha in TIMRET.

The analyst can enter up to 100 transactions per case.

Description. This is a 30-character description of the benefit/cost being entered, such as market value of increased yield. Enter a description that defines the entire investment benefit/cost and return flow pattern.

Present Value ($/ha). Enter this value of benefits/costs in units of dollars per hectare ($/ha). A cost is entered as a negative number, a benefit as a positive number. Because TIMRET allows unrestricted input for the description of the benefit/cost, it cannot determine whether a transaction should be a cost or a benefit; it is therefore important to enter the present value with the correct sign. (The program does check for this type of error.)

First Year. This means first year relative to Year 0, the year in which the benefit/cost occurs. This is a required input for all benefits/costs analyses.

Last Year. This means last year relative to Year 0. The actual number for the last year must be equal to or greater than that in the first year. If the last year is equal to the first year, the benefits and costs incurred in the latter will also apply to the former year.

Step Year. This is the number of years between each occurrence of a benefit/cost. This is entered only if the benefit/cost occurs more than once. If the benefit/cost occurs in a single year, the field should be set to 1.

First, last, and step years are expressed as stand age at renewal, treatment, and harvest. TIMRET establishes the base year as the earliest year (the year with the lowest number). Length of investment (the difference between the first and last year), cannot exceed 200 years. (See trouble-shooting guide if investment period exceeds 200 years.)

ECONOMIC PARAMETERS

Discount rates are annual rates in percent and can be **real** (without inflation) **or** nominal (with inflation) **values.**

Inflation rate is the average annual rate in percent expected over the life of the investment. Use an inflation rate of 0% for analyses done in real or constant dollar terms.

For **discounting,** all cash flows are treated as if they occur at the beginning of the year. Costs and revenues that occur in Year 1 are therefore discounted for one year (to the beginning of Year 0).

Each activity is expanded into one or more **cash flows.** A cost or revenue amount is calculated for the first year and repeated every step year until the last year. If the first year is the same as the last year, only one cash flow is computed. No cash flows will be computed for years beyond the last specified for the transaction. The extended cash flow amount is computed where N is the number of years from the base year of the activity.

ACTIVITY LIST

A list of benefit/cost activities is displayed at all times except when displaying a graph or calculating financial criteria. Several activities are displayed at once, but the user can scroll through all of them by using the arrow keys and the **Page Up** and **Page Down** keys. A full screen activity list can be obtained by executing the **Window** macro (Alt-W) to eliminate the results window. Simply re-execute the **Window** macro to restore the results window.

A complete activity list can be printed by executing the **Print** macro (Alt-P), choosing Text from the menu, and typing in the number of lines that need to be printed.

FINANCIAL ANALYSIS RESULTS

Tabular Presentation. Financial returns are computed after executing the **Calculate** macro (Alt-C) and selecting the **Calculate** option. Within a few seconds, the results will be displayed in the financial analysis section of the screen.

The four financial criteria are shown for the six discount rates selected.

Internal Rate of Return (IRR) is the discount rate that equates discounted costs and revenues. IRR is the return on investment if all immediate revenues are reinvested in the project. IRR is not affected by the discount rate. If the IRR can not be determined then **ERR** will be shown, indicating an error.

Present Net Worth (PNW) is discounted benefits less discounted costs. A positive value indicates return exceeding the discount rate.

Benefit/Cost Ratio (B/C) is the present value of the benefits divided by the present value of the costs. A value greater than 1.0 indicates that the discounted benefits exceed costs.

Profitability Index (PI) is the present net worth divided by treatment cost. It is used to rank investment in order of profitability.

Graphical Output. The built-in graphic capability of the Lotus 1-2-3 version 3.1 **TIMRET** package allows instantaneous on-screen display of calculated financial criteria and a printed copy (Figs. 1–3). This feature is also available on other financial analysis software packages.

To display a graph on the screen, execute the **Graph** macro (Alt-G), choose the financial criteria to graph, and then choose the style of graph. Hit any key to return to editing. To print the graph most recently plotted, execute the **Print** macro (Alt-P) and choose Current graph from the menu.

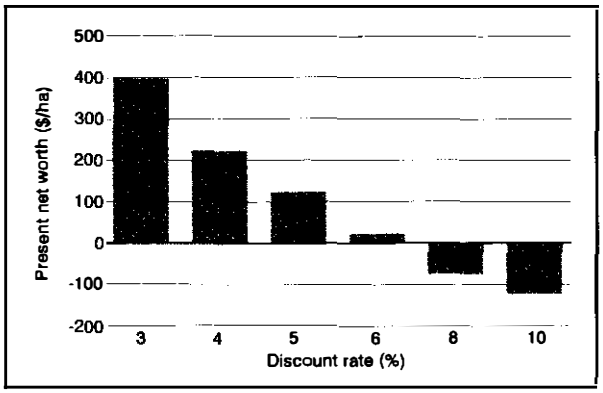

Figure 1. Output from TIMRET showing profitability analysis of lodgepole pine thinning by present net worth.

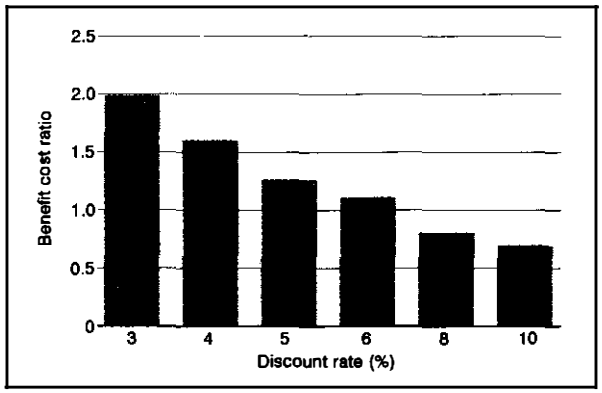

Figure 2. Output from TIMRET showing profitability analysis of lodgepole pine thinning by benefit/cost ratio.

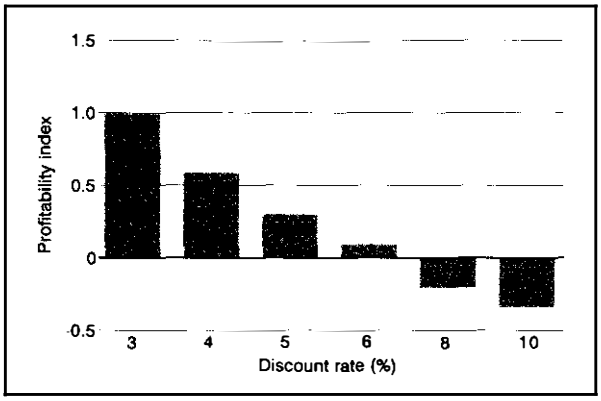

Figure 3. Output from TIMRET showing profitability analysis of lodgepole pine thinning by profitability index.

SAVE/LOAD DELETE

TIMRET allows the analyst to save and load cases from a data disk. To save or load cases using a floppy disk, it is a good idea to first change the working directory to the floppy drive. This is accomplished by executing the **File** macro (Alt-F) and choosing Directory from the menu. At the prompt, enter in the new working directory to be the path of one of the floppy disks (e.g., A:B:).

Saving the Current Case. Execute the **File** macro (Alt-F), choose Save from the menu, and type a file name that identifies the case. If this file already exists, the analyst will be presented with another menu with three options: Cancel, Replace, and Backup. Choose Cancel to abort the save operation, Replace to write over the old file, and Backup if the old file is still needed.

Retrieving a Case. Execute the **File** macro (Alt-F), choose Retrieve from the menu, and type in the file name of the case to be retrieved.

ADVICE WHEN USING TIMRET

Distinguishing Cases from Worksheets. There is no way to distinguish a saved TIMRET case from a regular Lotus worksheet. To avoid error and confusion, save all TIMRET cases on a separate data disk or in a separate directory.

Making Backups. As a precaution, one should make a backup copy of the TIMRET disks upon receipt for safe storage. These programs are not copy-protected or copyrighted. Do not use the original program and data disks except to make additional copies.

Always Verify Inputs. Look out for some of the following common errors that can be made when using this program:

- important treatments left out, especially costs.
- errors in data.
- number of years exceeds 200.
- relative year values are not correctly calculated.

TROUBLE-SHOOTING GUIDE

Too Many Cash Flows. Long investment cases can result in more than 100 cash flows, a number that must be reduced to conduct an analysis. An excessive number of cash flows can occur by including several annual costs such as management fees and leases in the transactions. One solution is to combine similar activities within a year, such as all activities with the same tax treatment. Another option is to combine costs or revenues spread over several years into fewer payments. For example, instead of using an annual management fee, apply a double amount every second year. This will have only a minor effect on the outcome.

Long Investment Periods. TIMRET does not accept an investment period if it extends beyond 200 years. Although this is unlikely to occur, one solution would be to reduce arbitrarily the investment length to 200 years by compressing cash flows into a shorter period. The present value of costs or revenues that occur in the distant future is very small, so the effect on the outcome is small. A dollar received in 200 years is worth less than 0.1 cents today after discounting at 5%.

GENERAL INFORMATION

Appendix 1 is a quick reference guide that can help in this software operation. Suggestions for further reading are listed in Appendix 2.

User comments are welcome. Contact:

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APPENDIX 1
TIMRET QUICK REFERENCE

The Basics of Using TIMRET

TIMRET is a Lotus 1-2-3 worksheet equipped with a number of macros to help the user work efficiently. All macros are executed by using an **Alt-<letter key>** combination. In order to run a macro, the **Alt** key must be held down while the letter key is pressed. All macros described below can also be accessed through the use of a main menu **(Alt-M)**.

The macros also take advantage of Lotus-style menus that appear at the top of the screen. To use a Lotus menu, move the highlighted cursor over the menu choice and hit the **Enter** key or simply type the first letter of the menu choice.

To edit blocks of data in the editing area, use the Lotus 1-2-3 commands of **Copy, Move,** and **Range Erase**. Do not use **Worksheet Delete Row** or **Worksheet Insert Row.** Other useful features available in Lotus 1-2-3 are the **F2** key (edit an entry), and the **F10** key (redisplay graph). Refer to your Lotus 1-2-3 manual for more information on these and other editing commands.

The TIMRET Macros

Alt-C (Calculate)

When the user adds, deletes, or edits new data, the results in the bottom window will not change. In order to see the results of changes made, this macro must be used.

Alt-F (File)

This macro is used to bring a case into memory from disk or to save the current edited data to disk. Using this macro, the user can save the current case to disk, retrieve a case from disk into memory, or change the working directory. Only files previously saved with TIMRET can be loaded in without error.

Alt-G (Graph)

This macro allows the user to graph PNW, B/C, or PI versus the discount rate. The macro will prompt the user for the type of data and style of graph desired. Once chosen, the graph will be displayed on the screen. Hit any key to return editing.

Alt-P (Print)

This macro is used for printing either the edited data and results or a graph of one of the economic statistics. Once the user has specified what to print, the macro will pause and tell the user to ready the printer. Once the printer is ready, the user should hit a key to send the selected output to the printer.

Alt-W (Window)

The economic results normally appear in a window at the bottom of the screen. If full screen editing is desired, execute this macro eliminate the window. Simply execute the macro again to reestablish the window.

Alt-X (eXit)

Exits the user from TIMRET as well as Lotus 1-2-3. Be sure to save data with **Alt-F** before exiting.

APPENDIX 2
SUGGESTED READINGS

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